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ENGLISH EDUCATION WITH SERIOUS GAMES

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ABSTRACT

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Learning English, for kindergarten students, is both a global imperative and an enormous challenge. English has become a dominant language in the world today, the international language of business, science and culture. New generation's interest on digital games and the necessity of starting English learning at early ages have been directed to develop interactive games. The purpose of this study is measuring the effect of serious games on the achievement and motivation of 6 years old students. The game, Diamon, was designed by using the Spiral Education Game Design Model. The content was identified by investigating the existing applications and literature. In order to evaluate the effectiveness of our game, an experiment has been conducted in a kindergarten to examine the student's performance by pre and post-tests, and the learning motivations by a survey. 52 students participated to the research. It was found a meaningful difference between pre-test and post-test scores, and a significant value was obtained at the outcome of motivational survey. The findings show that Diamon had a positive impact on student's achievements in language learning and motivation.

Keywords: Serious Games, Game-based Learning, Interactive Learning Environments, Motivation

ÖZET

EĞİTİCİ OYUNLARLA İNGİLİZCE ÖĞRETİMİ

Ceren Gülra Melek

Bilgisayar Mühendisliği

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Anaokulu öğrencileri için ingilizce öğrenmek hem küresel bir gereklilik, hem de büyük bir arzudur. İngilizce bugünün dünyasında belirleyici ve ticaret, bilim ve kültür için uluslararas bir dildir. Yeni jenerasyonun dijital oyunlara olan ilgisi ve erken yaşta ingilizce öğrenme gerekliliği interaktif oyunların gelişmesine yol açmıştır. Bu çalışmanın amacı eğitici oyunların 6 yaşındaki öğrencilerin başarı ve motivayonlarına etkisini ölçmektir. Diamon eğitici oyunu Spiral Eğitici Oyun Tasarım Modeli'ne göre geliştirilmiştir. İçerik, mevcut uygulamalar ve literatür araştırmasıyla belirlenmiştir. Oyunun etkinliğini ölçmek amacıyla uygulama, ön-test ve son-test ile öğrencinin performansını, anket ile öğrenme motivasyonunu incelemek için bir anaokulunda yürütülmüştür. Araştırmaya 52 öğrenci katılmıştır. Ön-test ve son-test sonuçları arasında anlamlı bir farklılık bulunmuş ve motivasyon anketi çıktılarından yüksek bir değer elde edilmiştir. Bu bulgular, Diamon oyunun dil öğreniminde öğrencilerin başarısını ve motivasyonunu olumlu etkilediğini göstermiştir.

Anahtar Kelimeler: Eğitici Oyunlar, Oyun-tabanlı Öğrenme, İnteraktif Öğrenme Ortamları, Motivasyon

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ABBREVIATIONS

3D	:	3 Dimension
2D	:	2 Dimension
ANCOVA	:	Analysis of Co-variance
ARCS	:	Attention, Relevance, Confidence, Satisfaction
ATOM	:	Animasyon Teknolojileri ve Oyun Geliştirme Merkezi
DG-LLG	:	Spoken Dialog-Based Language Learning Game
ESA	:	Entertainment Software Association
GFK	:	Growth from Knowledge
HELLO	:	Handheld English Language Learning Organization
IBM	:	International Business Machines
IMMS	:	Instructional Materials Motivational Survey
iOS	:	iPhone Operating System
MANCOVA	:	Multi-variance Analysis of Co-variance
METUTECH	:	Middle East Technical University Technocity
PC	:	Personal Computer
QA	:	Quartis Atlantis
SHAIEx	:	Sistema Hipermedia Adaptativo para la ensenanza de idiomas en entorno Linex
SPSS	:	Statistical Package of Social Sciences
U.S.A.	:	United States of America
VR-ENGAGE	:	Virtual Reality- Educational Network for Global and Grassroots Exchange

1. INTRODUCTION

Increasing the spend time at the computer and the request to reach information in the shortest and the most entertaining way has led to the occurrence of new education concepts. The new education concepts had led to the formation of new areas of research. One of these is serious games. In this research, the impact of serious games on students' English learning and motivation was investigated. In this section, the concepts such as English education, games and serious games that form the basis of this research were described and the purpose, importance of the study were explained.

1.1 ENGLISH EDUCATION

Today, as a result of economic and technological developments, English has become a "world language" that is used in almost all countries. Learning English is required to capture the era as a requirement of globalization, to provide the technological, economic and cultural communication with other countries. People have to get to know different languages and ways of life to obtain universal science such as democracy and human rights, art, technology, education, and cultural values to move own values to the universal dimensions. In addition, English is an important tool for both business and social life. Who used this tool in an effective way, become more successful compared to others in both areas.

Learning English requires memorizing many words, using a different grammar structure from Turkish and making lots of practice. Therefore, many of students in Turkey have negative attitude towards English because of think that learning English is difficult and they will never be able to speak English. This situation starts with decide to learn English and continues increasingly with advancing age. Learning English should be initiated at an early age because of the mastery of at least one foreign language seems to be a necessity nowadays. Recent studies have showed the advantages of an early start in second/foreign language learning. Foreign language teaching is a phenomenon that is long-term, continuous and effective in the development of the child's brain (Arıcı and Demir, 2009). Correctly configured foreign language teaching provide a positive contribution to the child's mental development, his horizons, perspective, view of the world has a positive impact on the development of personality and identity enriching.

Especially, children whose ages' between 5 to 8 are keen and enthusiastic, active and interested. Additionally, they are usually less anxious and less inhibited than older language learners (Pinter, 2006). In this respect, teaching a foreign language to children is important but this should be done in a fun way without strict structures and rules. Because, previous studies have shown that the chosen teaching method has an important role in this regard. Language learning in early ages and digital games are related to each other because digital games provide discovery and experimentation in a playful and relaxed context. Learning with discovery and experimentation in a playful and relaxed context is also more efficient for children (Baker, 2000).

1.2 GAMES

The game is an activity that exists at every stage of human life. Games are seen as sports and entertainment, racing against both him and the other players in order to achieve certain specific objectives with specific rules. Games have an important role in personal development of children. Games help to development of children's imagination, creative skills, mental, physical and psycho-social. Additionally, playing games is an effective way of creating many of optimum conditions for language acquisition (Tomlinson & Masuhara, 2009; Uberman, 1998). Nowadays games are played on computers and tablets when playing games with traditional methods in the past. In last 40 years computer games have been the most important leisure time activity and have replaced the place of traditional games (Bedi and Hrustek, 2013). The game platforms, the types of games and the number of teenagers and adults who play these games are increasing every day because of some characteristic features of games.

According to Prensky (2001), games have the 12 characteristic features that makes appealing.

i. Games are in entertainment format that give us pleasure and entertainment.

ii. Games are in game format that provide excitement and ambition.

iii. Games have rules that provide us to do the planning.

iv. Games have goals that provide motivation.

v. Games are interactive that must be done something.

vi. Game are adapted that provide flow.

vii. Games have outputs and feedback that provide to learn.

viii.   Games have winning status that provide to the satisfaction of the ego.

ix.   Games have contention, challenge, competition, contrast modes that provide us adrenalin.

x.   Games require problem solving that provides to develop creativity.

xi.   Games are interactive that allow us to create social groups.

xii.   Games have the views and a story that win us the feeling.

Most of people of all age play these games because of games technology is inexpensive, widely available, fun and entertaining. According to the findings come from the ESA's (2013) Sales, Demographics and Data report, about 58 percent of American from all age range play video games. Increase in interest to the game led to the development of the gaming industry and introduced the concept of games designed for a serious purpose other than pure entertainment.

The effects of this development of gaming industry are seen in our country. According to international research firm GfK Turkey (2009), research which carried out face to face interviews with 1,655 people representing the whole city for METUTECH-ATOM, 65.8 percent of boys and 46.6 percent of girls between the ages of 8 to 15 are playing computer games. The 26 percent of research participants playing games less than 1 hour in a week, and 45 percent of them is playing 1-2 hours per week, 24 percent of them is playing 3-10 hours. According to the study, children between the ages of 8-15 are playing video games on average 3.5 hours a week. According to the results of "Gaming habits of people over the age of 15 in Turkey" that is another research of GFK Turkey, one of every three people over the age of 15 playing the games. In our country, gamers over the age of 15 playing games approximately average 6 hours in a week. For this reason, to examine the current situation and also to investigate the effects of computer games in Turkey have become important (Durdu, Tüfekçi ve Çağıltay, 2005).

1.3 SERIOUS GAMES

Serious games are part of computer-based education method to motivate students and direct them to certain activities. According to Connolly, Stansfield, and Hainey (2007) games-based learning can be defined as the use of computer games-based technology approach to deliver, support, and enhance teaching, learning, assessment and evaluation. The main purpose of serious games is to train or educate to users when playing the

game. Therefore, properties of games and education should be associated and balanced with each other in serious games. There are many reasons for the use of games in education. Carrying educational elements of the game and increasing the spent time by playing games has caused the use of games for education. The properties of serious games provide numerous benefits to students' skills and knowledge. According to Berns, Gonzalez-Pardo and Camacho (2012), games make learning easier, faster, entertaining and fun with providing real time feedback, competition and collaboration. Additionally, games provide an effective educational environment. Because video games provide to users strong learning experiences, interactive learning environment and problem-focused learning. Users can get immediate feedback on their actions with a "learning-by-doing" approach. Users are encouraged to be problem-solvers and they can apply their experiences to real life. Serious games facilitate access and personalize the learning experience by offering a learning tool students can use anytime-anyplace (Kato, 2010). Serious games allow to students detection facts and events, decision-making on critical situations and the acquisition of knowledge and skills. Serious Games offer immersive and virtual environments that provide students a realistic opportunity to practice and develop a variety of different competencies (Adams, 2010; Blakely et al., 2008; Rochmawati and Wiechula, 2010).

Learning by serious games is not more complex especially for new generation. As Mark Prensky (2001) has suggested, today's students are no longer the people the current educational systems have been designed to teach. Today's students have enormous access to digital technology and display characteristics such as digital fluency and familiarity with new technologies never before imagined, they are digital natives (Prensky, 2001). Nowadays, children and young people, even adults play serious games without difficulty of getting used to the game environment and playing the game.

1.4 THE PURPOSE OF STUDY

The study has two significant purposes. Firstly, how the serious games impact on students' learning was investigated. Secondly, the serious game is motivational or not for students was investigated. For this purpose, the one group pre-test post-test model and the motivational survey were used in this research. The one group pre-test post-test model is the most useful model for the measurement of the effect of an educational

method as independent variable on a student success as dependent variable. The motivational survey was used for the measurement of the motivational effect of an educational method on students. In this study, some of the topics such as numbers, animals, fruits, colors, seasons, days and months in beginner level of English are designed educational games format to provide learning English to 6 years old students in a fun way. The pre-test and post-test that was prepared according to outcomes gained from this game by the students, to be applied to students before and after playing the game. The obtained data from the results of pre-test and post-test was analyzed by paired sample t-test that is an analysis model to compare the average values of a characteristic measured on a continuous scale between two conditions of the same group. According to analyzed data, the difference between pre-test and post-test results show how the serious games impact on students' learning. The motivation survey was prepared based on Keller's (2010) Instructional Materials Motivational Survey (IMMS) to measure the motivational effect of the game on students. The Cronbach Alpha value was used to understand the reliability of the motivation survey. The frequency distribution for a single variable was used for to evaluate the obtained data from the motivation survey.

The research aims to create a Serious Game which called Diamon and measure the effect on success and motivation of students. All phases of the research were explained in the following sections. Firstly, previous studies about serious games were examined before the creation of game. Then, data and research model involves phases of designing the game; the study group, the experimental design, creation the test and survey, analyzing the data were described. After that, obtained results from the research and the discussions about the results were explained. Finally, conclusion of the research and suggestions for further studies were shared.

1.5 THE IMPORTANCE OF THE STUDY

Learning methods are changing with the new information and communication technologies. In the current "Information Age", computers, multimedia, audio, video, animation, new concepts and technologies such as the Internet and developing Internet technologies has taken place in education and training (Alakoç, 2003). People find boring classical learning methods and they prefer more reachable and more

entertainment learning models. For this reason, the idea that computer games can be used in education has become increasingly common with the historical development of computer games. Also, foreign language lessons are the areas of the most needed to benefit from the opportunities of emerging technologies to teachers and students.

Children should be become active in the teaching-learning environment and should take pleasure from learning in the years of primary school. To ensure this, the information to be learned with the learning style and needs must be appropriate. At this point, game-based learning is highly important. Children learn many things by trying to self, enhances the capabilities, acquire many skills without difficulty, and become free from adults and the pressure of the outside world during the game (Rozan, 1985).

Nowadays, children spend most of their time at the computer with playing video games and technological devices. There is a growing need to know the effects of game-based learning and serious games on students' achievement with the growing attention. For this reason, computer games attract the attention of many researchers who wish to use these games to educate new generation students (Prensky, 2001).

An impressive and facilitating learning environment is provided with appealing to the world of fun and imagination of children. At the end of the study, learning the effect of this environment to students' achievement and motivation would lead to become widespread the use of serious games in education and would made more extensive research about the use of serious games.

2. PREVIOUS STUDIES

In this section, the national and international researches about serious games were examined. Firstly, the information about development process of games and serious games was given. After that, the studies on the subjects of comparison of traditional and game-based learning, for and against the usefulness and effectiveness of computer games, effects of computer games on students' success were examined. Finally, information from previous studies was evaluated and inferences were made for the research.

The terms of "Video games" and "computer games" are used interchangeably and their development processes have been together due to the similar features. The first commercial computer game Pong is produced in 1974. At the end of the 1970s, Space Invaders, Pac-Man has seen a huge demand because of game consoles were more affordable than personal computers in that period. At the 1980s, Atari, Sega and Nintendo and Commodore 64 game consoles reached a large number of sales. By the 1990s, computer games have gained a new dimension with the spread of the IBM personal computers and the development of graphics cards.

Games haven't been used in just the entertainment industry, it began to use outside the main purposes. In fact, the idea that computer games can be used in education, have continued with the history of computer games. Computers were advertising the use for educational purposes at all times. Lots of educational software was appeared for personal computers. In addition, educational content games went on the market with the idea of learning to transform it into a game. A considerable number of serious games have been developed over the last ten years with developing new technologies such as mobile technologies, online games, and virtual worlds.

The recent emergence of serious games as a branch of video games has introduced the concept of games designed for a serious purpose other than pure entertainment. To date the major applications of serious games include education and training, medicine and healthcare, engineering, military applications, city planning, production, crisis response, public policy, cognition, psychology, communication, decision-making, cultural heritage, environmental issues, sociology, international studies, peace and conflict studies, economics, marketing, business, management, and entrepreneurship.

Researches about the serious games was needed with the starting to use games for educational purpose. There has been a distinct increase in the volume of material published about the use of computer games since the year 2000. There are many claims found in the literature about comparison of traditional and game-based learning, the usefulness and effectiveness of computer games, how computer games affect students' success.

Gee (2003) identified 36 different learning principles to why games are good for learning such as design, semiotic, identity, committed learning, self-knowledge achievement, practice, ongoing learning, probing, multiple routes, situated meaning, text, intertextual, multimodal, intuitive knowledge, subset, incremental, discovery, transfer. For instance, identity principle provides a tripartite play of identities as learners relate, and reflect on, their multiple real-world identities, a virtual identity, and a projective identity (Gee, 2003, p. 208). Practice principle provides to learners get lots and lots of practice in a context where the practice is not boring. Therefore, they spend lots of time on task (Gee, 2003, p. 208). The another learning principle is probing principle based on "Learning is a cycle of probing the world" hypothesis; reflecting in and on this action and, on this basis, forming a hypothesis; reprobing the world to test this hypothesis; and then accepting or rethinking the hypothesis (Gee, 2003, p. 107). All of these principles of games provide an effective environment for learning.

Chen and O'Neil (2005) and O'Neil, Wainess and Baker (2005) made a more compherensive and helpful study about the perceived instructional usefulness and benefits of computer games over 4,000 articles published in peer-reviewed journals. They provide a detailed analysis of how computer games providing complex and diverse approaches to learning processes and outcomes, interactivity, the ability to address cognitive as well as affective learning issues. They make the point that all of the methods used in games have been effective on children and they regard as most importantly that of motivation for learning.

Healy and Connolly (2007) compared game-based learning and the traditional method of learning in their study. According to this comparison, the eight significant differences between game-based learning and traditional learning were found. The differences are shown in the following Table 2.1.

Table 2.1: Comparison of traditional and game-based learning

Comparison of Traditional and Game-Based Learning	
Traditional Learning	**Game-Based Learning**
Passive	Effective and interactive
Focused on listening and reading	Based on doing
Teacher-oriented	Learner-oriented
The proven method	The lower validity
Outdated	Actual
Slow and authoritarian	Fast and investigative
Development of listening, reading, digital, communication, teamwork skills	Development of social and communication skills, problem solving, analytical, discussion, data processing, strategic thinking, planning skills
Face-to-face	Attractive

Reference: Healy, A. and Connolly, T., 2007. Does Games-Based Learning, Based on a Constructivist Pedagogy, Enhance the Learning Experience and Outcomes for the Student Compared to a Traditional Didactic Pedagogy?, The European Conference on Games Based Learning, 25-26 October 2007 Scotland: Proceedings of ECGBL 2007.

Can (2003) investigated computer teacher candidates' perceptions on the use of computer games in education. In addition, attitudes of the participants towards playing computer games and using computer games in their lessons were also investigated. The 116 participants were the fourth year students from Ankara University, Gazi University, Hacettepe University and METU. Data were collected through questionnaires and interviews. Data about demographic information, their computer game experience and how they assess their leisure time were collected in the survey. At the end of the survey, two open-ended questions were asked about using games in education. Descriptive statistics and quantitative data analysis methods were used to analyze the data. The study showed that teacher candidates have positive perceptions on the use of serious computer games in education. In addition, many participants indicated that it plans to use this kind of games their future jobs. However, a little part of participants has also some issues and doubts about the use of games in education.

Demirbilek, Yılmaz and Tamer (2010) conducted a study on to analyze second language instructors' perspectives about the use of educational games. The 11 academicians from the School of Foreign Language a university located on the South West of Turkey were selected by random sampling method to study. A series of semi-structured interviews were prepared for analyzing the perspective about educational games in second language learning at the graduate level. Each interview lasts approximately 20-25 minutes. The collected data from semi-constructed interviews were analyzed by "Grounded Theory" method. According to data analysis, four categories were formed to reflect the perspectives of foreign language instructors'. The categories are "current situation", "usage", "game features" and "efficacy to lesson" respectively. As a result, the relationship between categories was found that efficacy to lessons depends on usage, and the usage depends on the game features and current situation. This relationship was shown in a model for using educational games in second language courses.

McEacharn (2005) conducted a study on the use of games in the learning environment. Participant responds to multiple-choice questions posed to him in the "Who Wants to be" game format. To do this, three wildcards are entitled to participants: first wildcard is the elimination of two responses that are wrong, second wildcard is the presentation of the correct answer to graders voting, and third wildcard is asking to the team. The exam results are compared in the audit course classes before and after the game. The first test score increased from 76 percent to 79.3 percent. The second exam result increased from 76.8 percent to 80.8 percent. There wasn't any increase as a result of the third exam result. So, the average performance of students on the course increased from 81.1 percent to 82.1 percent. This increase is statistically significant, and the effectiveness of the game on learning has been proven with those examinations. In addition, according to a questionnaire applied to 31 students, the game was found to be a useful learning object. 95 percent of the students argued that the game is effective in learning course information.

Virvou and Katsionis (2008) examined the usability and popularity of virtual reality games for education. For this aim, the 3D virtual reality game with a high level of interference VR-ENGAGE was prepared to teach geography to students. 50 students between the ages of 11-12 participated to study. In the first part of the study, students tried to navigate and get to know the game environment for 2 hours at the school. The

usability of the game was evaluated in this way. Another day, game was played by students and the game's popularity was wanted to measure. In the second part of the game, they made a research on use and love VR-ENGAGE by children and adolescents in leisure times. At the end of research, VR-ENGAGE game was preferred to other computer games without educational value. The usability of game was measured by looking at the three values: VR environment's distractions, information of the user interface and effort for navigation. At the end of observations, the most of students didn't experience any significant usability issue. At the end of assessment, some conclusions were reached that an educational game motivate to students in the classroom and students learn better from a game compared to other types of educational software.

Lim, Nonis and Hedberg (2006) investigated how playing games in 3-D multi-user virtual environment affects the attractiveness of Science Course. Activities are conducted by Quest Atlantis which is a 3D virtual environment. Fourth-grade students were used as participants in a primary school in Singapore. Population of water, the water cycle and water treatment subjects were learned by students between the ages of 10 to 11 in QA environment. Students and teachers were observed and interviewed during the course. A pre-test and post-test was applied about the science course. A seven-grade scale is used to evaluate the attractiveness of QA environment. Although post-tests have a significant increase when compared to pre-tests, but the levels of attractiveness was low for students. Low attractiveness of the study is described as follows: 3D environment has distraction components; students have difficulties in QA environment's language; and students have deficiencies in computer skills to complete QA tasks.

Kızılkaya, Yılmaz-Soylu and Tüzün (2006) worked on college students receive computer literacy training in multi-user virtual computer environment. The difference of students' success and motivation between multi-user games-based learning environment and traditional learning environment was examined. In the study, pre-test and post-test with experimental and control group research design was used. In addition, demographic information questionnaire and motivation scale were applied to participants. In the spring semester of 2004-2005 academic years, 29 students were selected for experimental group and 24 students were selected for control group at

Hacettepe University Faculty of Education Department of Mathematics Education. The scenario was created in Multi-user gaming environment (Quest Atlantis) related to the topic "How Computers Work?" for the experimental group. In the classroom environment, the course was told with presentation for the control group. ANCOVA and the t-test were used to analyze the data obtained from the tests, questionare and scale. The significant difference was not statistically found between achievement scores and motivation values of experimental and control groups. As a result of research, in the well-designed multi-user game-based virtual learning environments, students can catch the both success achieved in the traditional learning environment. Also, this kind of games can be used effectively eliminating the limitations of time and the physical condition to broad masses. Thus, there can be offered the opportunity to interact and cooperate with individuals indicated.

Bayırtepe and Tüzün (2007) investigated on educational computer games for the elementary school students' achievement and computer self-efficacy in computer classes. For this purpose, seventh grade computer hardware course covering the subject has been prepared in a computer game. The research was prepared according to the control group pre-test post-test experimental model from quasi-experimental design. 25 students were selected for experimental group and 26 students were selected for control group at a primary school in Ankara. QA environment were introduced the experimental group for 2 weeks. In this process, touring in 3-D environment and understanding the characteristics of the media were provided. During the next two weeks, students of the experimental group were learned in gaming environment when students of the control group were learned the traditional learning method. Students were asked to fill the scale of the computer self-efficacy and the test of achievement before and after the application. According to the results of the achievement test that were applied before and after the implication, a statistically significant increase was realized in both groups. Two-Way ANCOVA was performed to look the difference between experimental and control groups for achievement tests and computer self-efficacy. However, a significant difference was not found in the achievement and computer self-efficacy between the game-based learning environment and traditional learning environment. Students like game-based learning environment which provided to reduce anxiety, to help the individual learning and to support learning as a visual.

Su (2008) investigated the effect of computer game-based instruction on the programming achievements of adult students. Participants were 146 Information Management System students in the class of Visual Basic programming at a college of technology. Participants are randomly assigned to experimental and control groups. The experimental group was composed of 65 students and the control group was composed of 81 students. This study was conducted with three teachers whose educations were similar to each other. Computer game based learning applied to the experimental group, programming was taught to the control group based on the method of expression. A different game was played out to students in the experimental group every week. Motivation, creativity, problem-solving questionnaires and programming tests applied to the students to assess the effect of these teaching methods to the programming success at first and the tenth week. Demographic data and computer experience data were collected from the participants. Data were analyzed by multiple regression and ANCOVA. ANCOVA analysis showed that the motivation scores of computer game based group was higher than the conventional group. The significant difference was not found between the two groups of students about creativity. In addition, as a result of statistical analysis, the experimental group was found to be more successful than the control group.

Kebritchi (2008) examined the effect of mathematic games to high school students' mathematic achievement and motivation. The study was made in U.S.A. The 76 students were in control group and the 117 students were in experimental group. Additionally, 10 teachers were participated to study. Students' mathematics achievement is measured with the game performance tests that prepared by school assessment exams and mathematics game developers. In addition, interviews were conducted. MANCOVA (Multivariate Analysis of Co-Variance) was used to analyze the data. MANCOVA results showed that significant improvements in the success of students in mathematics in the experimental group. In terms of motivation, there was not a significant difference between the experimental group and the control group. Teacher interviews had an important role in individual differences in the initial stage of playing game but the effects slowly decreased when the students gain the necessary skills to play. According to the results, math game that was used in this study, have been an effective teaching and learning tool to improve students' mathematic skills.

Tüzün, Yılmaz-Soylu, Karakuş, İnal and Kızılkaya (2009), examined a computer game towards learning geography for primary school students. Researchers designed and developed a three - dimensional educational computer game. In the study, 24 students in the fourth and fifth classes from a private school in Ankara have taken place as a participant. Participants have acquired information about the world continents and countries in this game for three weeks. The impact on student achievement and motivation of the game environment was examined. Both qualitative and quantitative methods were used to collect data. Analysis of the first and last achievement tests showed that students carried out significant learning in game-based learning environment. Students showed a higher intrinsic motivation and a lower external motivation in game-based learning environment when compared the students' motivations at game-based learning environment and traditional classroom environment. In addition, the students were found to be more independent in game-based activities. These positive effects on learning and motivation, positive attitudes of students and teachers showed that computer games could be used as a tool to support students when learning geography in formal learning environments.

Sert (2009) prepared an educational computer game in Quest Atlantis 3-dimensional and multi-user environment for the internet subject at the course of Information and Communication Technologies. The study carried out with 266 high school students. In the study, pre-test and post-test with experimental and control group research design was used. The control group students learned in expression based environment and the experimental group students learned in computer game based environment. At the beginning of the experiment, survey of Information and Communication Technologies Usage Condition and Internet pre-test was applied to two groups. Additionally, Kolb Learning Style Inventory was applied to the experimental group students. At the end of the process, the Internet post-test was applied to both groups. Cross tables, Independent-Samples t-test, Paired-Samples t-test and an independent sample two-way analysis of variance (ANCOVA) was used to analysis of data. As a result of analysis, both narrative-based learning environment, as well as game-based environment took place, however, a statistically significant difference between the two environments found in student achievement. As a result of analysis, learning was realized in expression based environment and game based environment. However, in both environments, the

significant difference was not statistically found between student achievements. In addition, results showed that there isn't any statistically significant relationship between achievement and gender. There wasn't any statistically significant difference according to the students' learning styles in game-based learning environment.

The study conducted by Liu and Chu (2010) were investigated the results of how games affect the English learning achievement and motivation during content-based learning environment. English curriculum was made with using a content-based learning environment which is called the Handheld English Language Learning Organization (HELLO). HELLO has been help to students contend for learning activities including different educational strategies, game-based learning and content-based learning based on ARCS (Attention, Relevance, Confidence, Satisfaction) motivation theory. High school teachers and juniors were selected as participants. In this context, the two groups of students participated in game-based learning and other learning activities. During the experiment, test, research and interviews were conducted to the students. As a result, the learning outcomes and learning motivation revealed that game-based learning is more effective than other forms of learning.

Lee, Kweon, Noh, and Kim (2011) were made a research on the effects of language learning game on Korean elementary school students. For this aim, Spoken Dialog-Based Language Learning Game (DB-LLG) is an educational game designed for language learners to offer interactive conversations with in-game characters in interactive immersive environments. The 10 students from different elementary schools in age from 12 to 13 in Korea participated to experiment. The proficiency level of all participants was the same equivalent to advanced EFL (English as a Foreign Language) learners. A questionnaire (5-point Likert scale) which applied to students before and after the playing game was prepared to investigate the satisfaction in language learning after game, the learnability in language learning before and after game and the students' confidence with English before and after game. The results showed that students were highly satisfied in using DB-LLG for language learning in general. A significant difference was statistically found between student achievements in pre-tests and post-tests. Students showed increase in the effects of learnability after playing the game. However, students' confidence level in English did not show significant increase after the language learning game.

Aghlara and Tamjid (2011) was investigated the effect of using a digital computer game and its role on encouraging Iranian children's vocabulary learning in acquisition of English as a second language at primary level. The digital game software used was called SHAIEx (Sistema Hipermedia Adaptativo para la ensenanza de idiomas en entorno Linex) for learning different numbers, animals, colors and family members. The 40 six to seven years old girls with no prior knowledge of English was selected as participants which were divided into two equal groups of experiment and control each consisting of 20 participants. In the experimental group, the SHAIEx digital game was used to teach English vocabulary. In the control group, English vocabulary was taught through traditional methods. Teaching period was a 45 day which consisted of three 90 minute sessions during the week. At the end of the teaching period, the participants' achievements were compared by final vocabulary test. The results of the final test in both groups were expressed as mean, standard deviation and were statistically compared using the independent sample t-test with the SPSS statistical software. The results indicated that the mean score of the children in the experimental group was significantly higher than those in the control group, indicating the positive effect of using digital games in teaching English vocabulary to children. Using such games in the classroom results in better motivation and facilitates the learning process of children and their cognitive achievement. The learning process becomes much more enjoyable and by engaging children in such games, the stresses involved in the learning process are drastically reduced.

Previous studies concluded that most of serious games was provide effective learning environment when the game was well-designed, objectives precisely defined and students were familiar the environment. Games should be designed according to learning objectives and the target group's interests. When the researchers evaluate the usability, motivation or effects of serious games, the pre-test post-test model was used. Therefore, the pre-test post-test model is appropriate to investigate the how affect the serious games to students' success in this study. Most of the studies showed that serious games had positive impact on students' achievement. Thus, this research was expected that the game of Diamon also will have positive impact on students' achievement.

3. DATA AND RESEARCH MODEL

In this section, the work done during the study were described with the titles the design of Diamon serious game, study group, experimental design, the English pre-test and post-test, the motivation test and analyzing the data.

3.1 THE DESIGN OF "DIAMON" SERIOUS GAME

Games technology is inexpensive, widely available, fun and entertaining for people of all ages. But, the creation of a Serious Game scenario is more complex than one developed for a classroom case study or a laboratory simulation (Dariel, Raby, Ravaut, and Rothan-Tondeur, 2013). In the numerous studies, design models about serious game were recommended. Akgün, Nuhoğlu, Tüzün, Kaya and Çınar (2011) was examined in the field of educational computer game design process and an educational computer game design model is proposed based on literature in accordance with the specified components of educational computer game design. According to obtained results from literature, Spiral Educational Game Design Model was created. This model shown in the Figure 3.1 was followed when designing the Diamon Game. The Spiral Educational Game Design Model consists of four main phase which are analysis, design, development and implementation, evaluation.

Figure 3.1: Spiral Educational Game Design Model
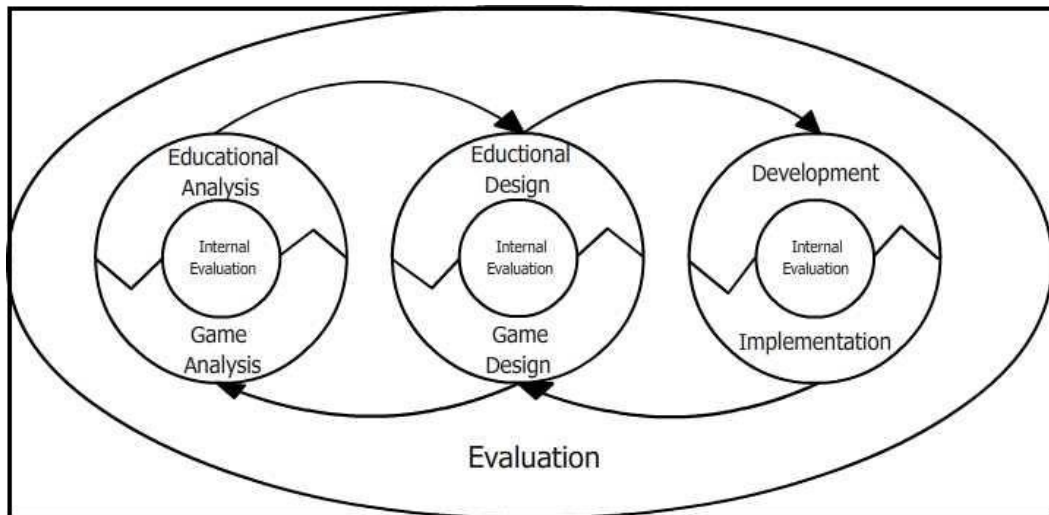
Kaynak: Akgün, E., Nuhoğlu, P., Tüzün, H., Kaya, G., & Çınar, M. (2011). Bir eğitsel oyun tasarımı modelinin alanyazına dayalı olarak geliştirilmesi. *Eğitim Teknolojisi Kuram ve Uygulama*, **1**(1).

3.1.1 Analysis

Analysis phase consist of two interrelated parts which are educational analysis and game analysis. In the Educational analysis phase; educational needs, characteristics of the target audience, purpose and content of the game is determined. In the game design phase, subjects of tools identification, limitations and benefits of tools, identification of game style, the requested goals and the acquired behaviors with playing game are examined.

Educational analysis was realized for this research. Firstly, educational needs were identified. There are starting English education at early age; requesting to reach information in any place at any time; using the advantages of technological developments in education. The target audience of the game was 6 years old children. The 21st century's children are interest in digital world dominated by computers and the internet. Many children have difficulty to focus their attention on boring information taught with traditional methods. Children tend to give up when they encounter any difficulty directly. Therefore, their skills should be developed slowly by increasing levels of difficulty. The Diamon game aimed to increase English achievement of target audience. Game content was prepared according to English level of target audience. The 6 years old children begin to English Learning new. English education starts with the learning of basic vocabulary. The vocabulary about numbers, animals, fruits, colors, seasons, days and months were selected for this research. In the previous studies about English education with games (Grivaa, Semogloua, Geladaria, 2010; Aghlara, Tamjid, 2011) similar topics were selected.

Game analysis was realized for this research. The game was planned to play on tablets. Although the tablets are not used so widely as computers, they provide greater convenience in terms of usability and access. Most of children are interest in to tablets and play various games on tablets. In serious games, the balance between game structure and educational structure should be provided. Children should not waste time trying to understand complex game structure. Therefore, the Diamon game consist basic game styles such as sorting, ordering, selection and catching. After the playing game, children were requested to be the mastery of English vocabulary in the game and increase their English achievement.

Unity 3D was selected as game engine was used for designing of game. Unity is a game development environment: a powerful rendering engine fully integrated with a complete set of intuitive tools and rapid workflows. Unity provides to create interactive 3D and 2D content; easy multiplatform publishing; thousands of quality, ready-made assets and a knowledge-sharing community. Unity 3D which is developed by Unity Technologies, is used by more than 500 thousand game developers around the world. Because of Unity provides many advantages for game developers. First of all, a game developed with Unity can be compiled as appropriate to different platforms (PC, Mac, Web, iOS, Android) without the need for any infrastructure changes. In this way, a game made for the PC with a single click can become appropriate to work in a Mac. Another advantage of Unity 3D is supporting programming languages (JavaScript, C# and Boo) which are more familiar to programmers. Addition to all these advantages of Unity, games written in Unity 3D can be played easily on the mid and upper levels computer. Therefore, Unity 3D was selected to develop the Diamon Serious Game in this research because of all these advantages.

3.1.2 Design

Design phase consist of two interrelated parts which are educational design and game design. Educational design consists of the components that are motivation, interaction, story, multiple detection, goals and rules, feedback, motivation, struggle and adaptation. Game design consists of the components that are connection, reward and challenge. In this research, educational design and game design were examined together with the six key game characteristics of Prensky. According to Prensky (2001), the six key game characteristics which are rules, goals and objectives, outcomes and feedback, conflict/competition/challenge/opposition, interaction, representation or story combined together to strongly engage the player.

3.1.2.1 Goals and objectives

All of the games have an overall goal and objectives that would enable to reach this goal. An element that separates games from other forms of entertainment is the purpose. The overall purpose of games is to win (Kramer, 2000). The purpose of game provides the willingness to continue the game or play the game again (Prensky, 2001). The purpose of educational game programs is to learn.

The purpose of the Daimon game is to learn some topics of English Beginner Level such as numbers, animals, fruits, colors, seasons, days and months when player completes their tasks in the levels. The topics shown in the Table 3.1 will be expected to be learned by the player who completes the game.

Table 3.1: List of words which are expected to learn by students

Numbers	Animals	Fruits	Colors	Days	Months	Seasons
One	Dog	Strawberry	Green	Monday	January	Winter
Two	Cow	Apple	Red	Tuesday	February	Fall
Three	Frog	Coconut	Blue	Wednesday	March	Spring
Four	Horse	Orange	Yellow	Thursday	April	Summer
Five	Bird	Kiwi	Brown	Friday	May	
Six	Lion	Cherry	Purple	Saturday	June	
Seven	Mouse	Grapes	Gray	Sunday	July	
Eight	Cat	Pears	Pink		August	
Nine	Chicken	Lemon	White		September	
Ten	Monkey	Banana	Black		October	
Twenty					November	
Thirty					December	

3.1.2.2 Rules

One of the most important characteristic of game is rules. Prensky (2001) stated that game is an organized entertainment and the most important feature which distinguishes it from any entertainment is the rules. Rules provide the emergence a significant structure by react the components of the game with each other. This set of rules describes rules to be abided, procedures to be followed and the possible reward and punishment.

The rules of the Daimon game:

i. Players must proceed starting from first level of the game. The difficulty and topics is progressing connected to game levels. Therefore, players cannot pass to the next level without ensuring the success in the current level. But, if player

desire, traversed levels can be played again to increase the score that previously received.

ii. The player has three life rights in each level and it gives the chance of making mistakes three times to player. Completing the level is expected from the player before finishing all of these rights. If player fail, the same level is played again with three life rights.

iii. Game can be played over the phone or tablet. Users can also play the game from different devices by connecting to Game Center continuing from where it left off.

3.1.2.3 Conflict, competition, challenge and opposition

Conflict, competition, challenge and opposition are the problems that you face and try to solve in a game. Educational game program should expose different competition formats because of the naturally objectives. Therefore, the student or users compete with any objects, time, itself or other competitors. The subject (mathematics, science, English), the environment (3-D, multi-user) and the type (adventure, role-playing, strategy) of each game program has different competition format.

In the Daimon game, the user competes with other players and with their own as well. Players competes with their own by repeat the game for trying to get a higher score from the previous score and compete with their friends to be first in ranking on Game Center.

3.1.2.4 Interaction

Interaction which is a mutually affect between students and resources, is different from one-way information transfer. Although educational games have a purpose, identification and explanation of target effector activities are needed. Additionally, situation of the game may change with the movement of the players (Prensky, 2001).

The characteristic of interaction was provided in the Diamon game. For instance, everything which is supposed to do is told to player at the beginning of each level. With the help of interaction, the game starts differently at any repetition and the player is expected to make different decisions from the previous one.

3.1.2.5 Representation or story

Representation in computer games gives you an idea of what the game is about. Representation can be performed directly with the description or can also be made indirectly. In the directly representation, a general statement can be made before the starting of game and the new descriptions can be also made during the game as needed. In the indirectly presentation, representation of the game are hidden in the game without making any statement. It is possible to understand what the representation is about after a period time of game. In this kind of games, representation is a common feature seen in all the game (Prensky, 2001). In the Daimon game, representation was provided with the using images and voices to gives the idea what the Diamon game is about. There are some detailed explanations which can be realized from the progress of the game by the player besides an explanation about each level.

Educational games have a scenario which is a basic topic of the program. The scenario can include entertainment topics besides issues related to course units. However, Alessi and Trollip (1991) recommend that the chosen topics and events are in harmony with the actual and simple events and include understanding, sensuality and intellectual events. Representation may contain elements of the story in the game. Nowadays, the games that contain the story element, is increasing. Story elements help to a better understanding of the game. In this game, a character was created for the game which name is Daimon. Daimon progresses step by step by completing tasks in the sections. If Daimon reaches the carrot by completing all sections in the game, success is achieved.

3.1.2.6 Outcomes and feedback

Outcomes and feedback provide to measure your progress against the goals. The outcomes of computer games are variables such as the remaining time, score, rankings, level of the game, the progress of the game is successful or not. The outcomes of measurement can be given as graphics, sound effects, animations, score and written or oral statements. The feedback is the response of the computer to students' input. At the end of an event in the game, the acceptability of changes comes as instant feedback. Prensky (2001) considers that feedback is an important factor to encourage learning in all of the educational games. Through the feedback, when players play the game again, they can change the outcome of the game by making different decisions.

In the Daimon game, the player receives feedback about the remaining life rights, score, his right or wrong decisions, the situation of win or lost in the relevant parts of the game. These feedbacks provide to orientate player correctly and increase intrinsic their motivation by evaluating the performance of the player in the game.

3.1.3 Development and Implementation

In the development phase, obtained components of the analysis and design phases were included to game menu. Characters, levels, stories in games and technical aspects such as tools and equipment were carried out.

The Daimon game was developed by topic-centered and activity-based approaches was followed to measure the effects of serious game to students' achievement in this research. The topic-centered and activity-based approaches are very appropriate for serious games. Because of each level of game showing in the Figure 3.2 was focused on different subjects of English. And learning was realized when students complete the activity in the level.

**Figure 3.2: Main screen of the "Diamon" serious game**
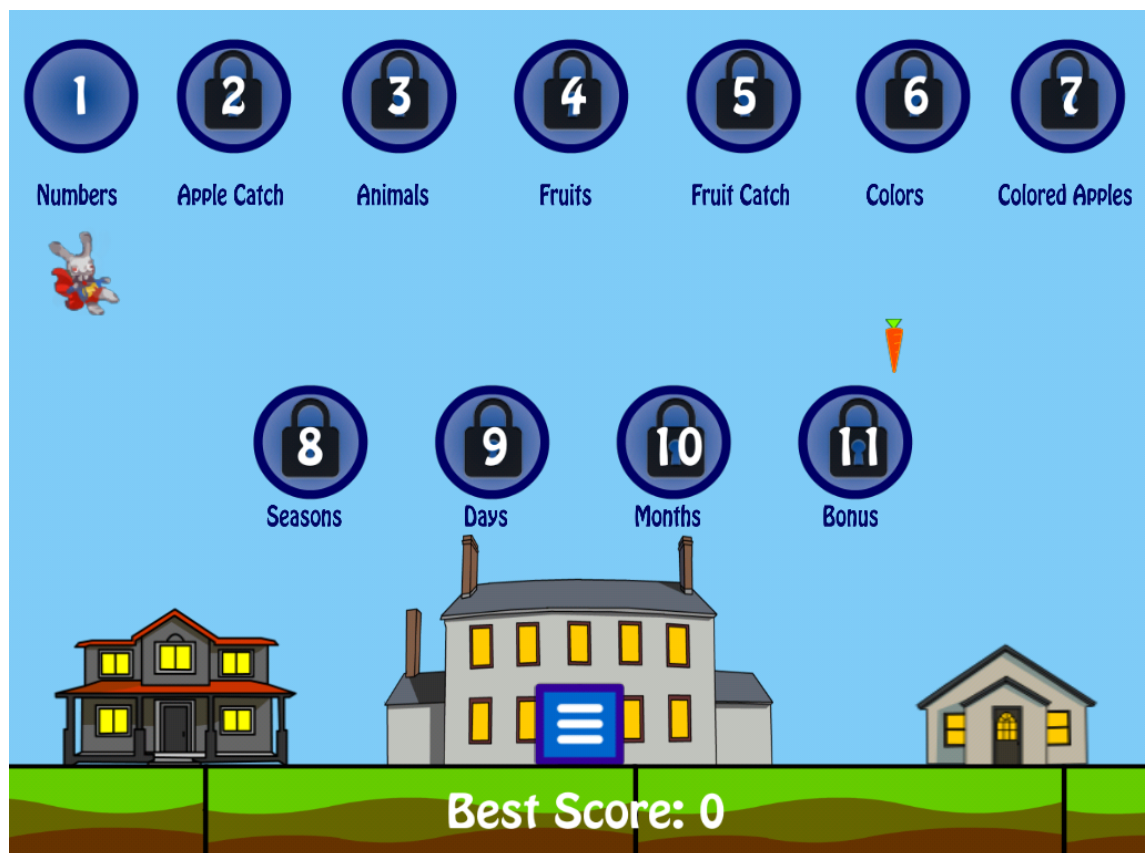
The game interface was developed according to game's content and students' interests, expectations and situations. The user interface controls the dialog between the user and the game. When developing the Diamon game, the main screen and screens of each level were designed with considering usability, design principles, interactivity, flexibility, control elements. Usability aims to improve the children's efficiency, effectiveness and satisfaction when they making the tasks in the levels. The usability was ensured by the convenience in usage of interface, the feedbacks, and the selection of simple and clear visuals. Design principles consist of color, ratio-proportion, appropriateness and balance. The background color of the game was blue which usually used in working environments and have a relaxing and creative effect on people. The colors of text and objects were selected compatible with the background colors in terms of visibility. The same shape, size and colors were used for interrelated objects were placed on the screen in a balanced manner. Interactivity was provided with feedbacks in written and verbally. The interface developed with flexibility to permit the changes after the implementation. Full screen menu and buttons of turn to main screen, replay and next level were used as control elements.

Unity 3D was used as game engine based on JavaScript Language for developing the Diamon game. All content such as scripts, textures, scenes, audio files of game was added to the Assets file. Each level of game was shown in a scene. The scenes consisted of GameObjects and scripts. For instance, physical objects and textures on the scene were GameObjects. The properties of each GameObject were added by components. The rotation, scale and position were defined in transform component. The scripts were assigned to each GameObject to make any change or movement. Variables, methods and classes that related to this event, were contained within the scripts. Additionally, the basic methods used in the each level of game was Start() and Update() functions. Start() function worked only one time when the scene first opened. The assigned initial values were specified in the Start() function. Update() function was updated in every frame. The continuously monitored methods and instances that control the movement of objects in the game, used in Update() function.

After the developing phase, implementation of game was realized. The deficiencies and errors in the game should be resolved according to evaluation the information obtained from playing the game by the sample group in accordance with the target audience. For

this aim, the Diamon game was played by 7 children who were 6 years old. As a result of observations and interviews, more sound effects, some additional feedbacks have been added to the game; errors about calculating the score and progress of the game have been corrected; some images have been changed to be more understandable of game. Therefore, the game had become the final version shown in the following figures.

Figure 3.3: The screenshot of Level 1
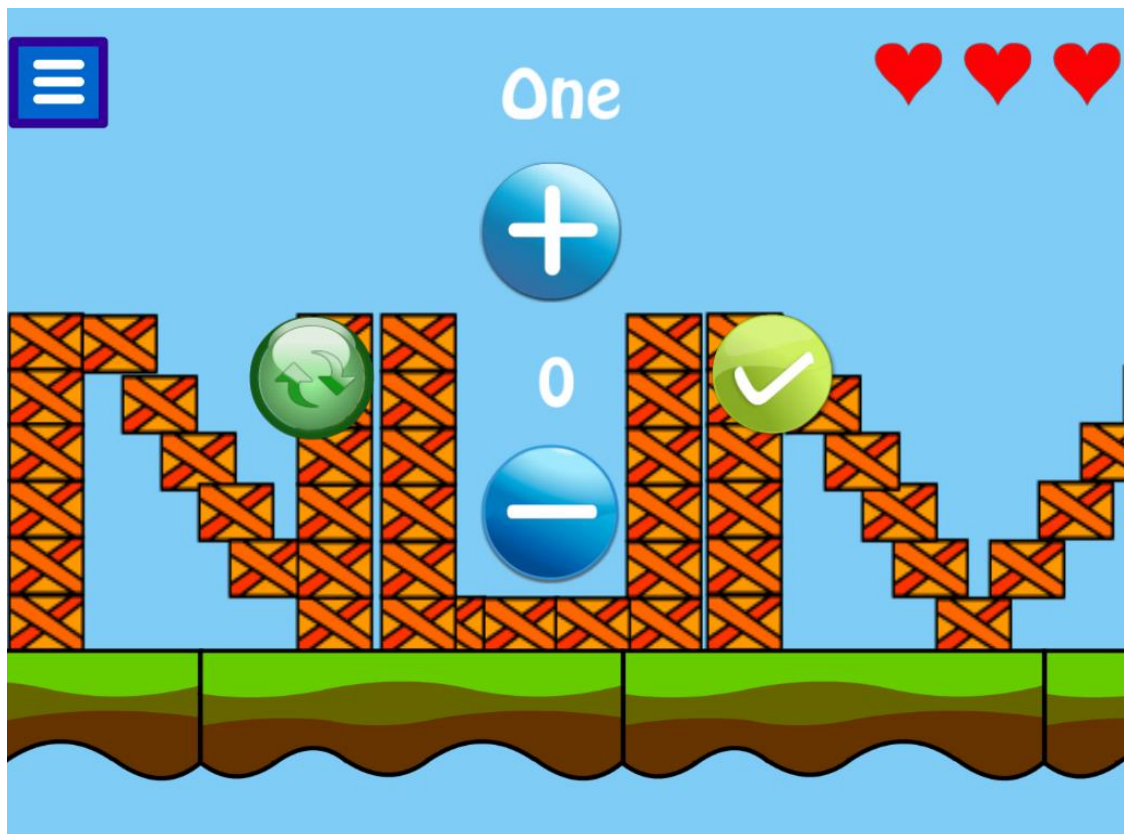
Level 1 shown in the Figure 3.3 is related to numbers. The user is requested tofind the number written in the upper-center of the screen and transmitted with audio. The number can be increased with plus button and decreased with minus button. The answer is given by pressing the confirmation button when the requested number was found. If the answer is incorrect, the one of life rights that showed with three red heart symbol in the right upper of the screen is missed and the same question is expected to answer. If the answer is correct, new question is asked. User can press the refresh button to reset the number of items; and press the menu button to return the main screen. The numbers between one to ten is expected to learn by users who complete the level successfully.

Figure 3.4: The screenshot of Level 2
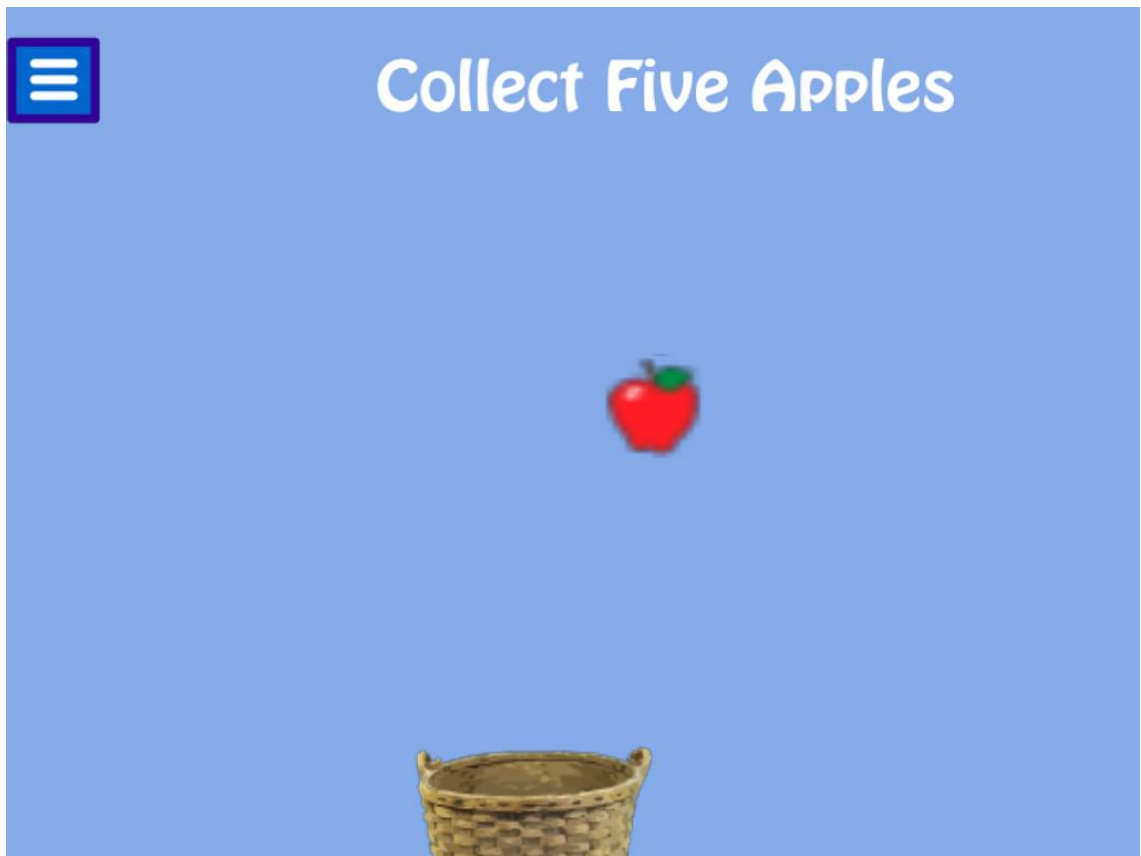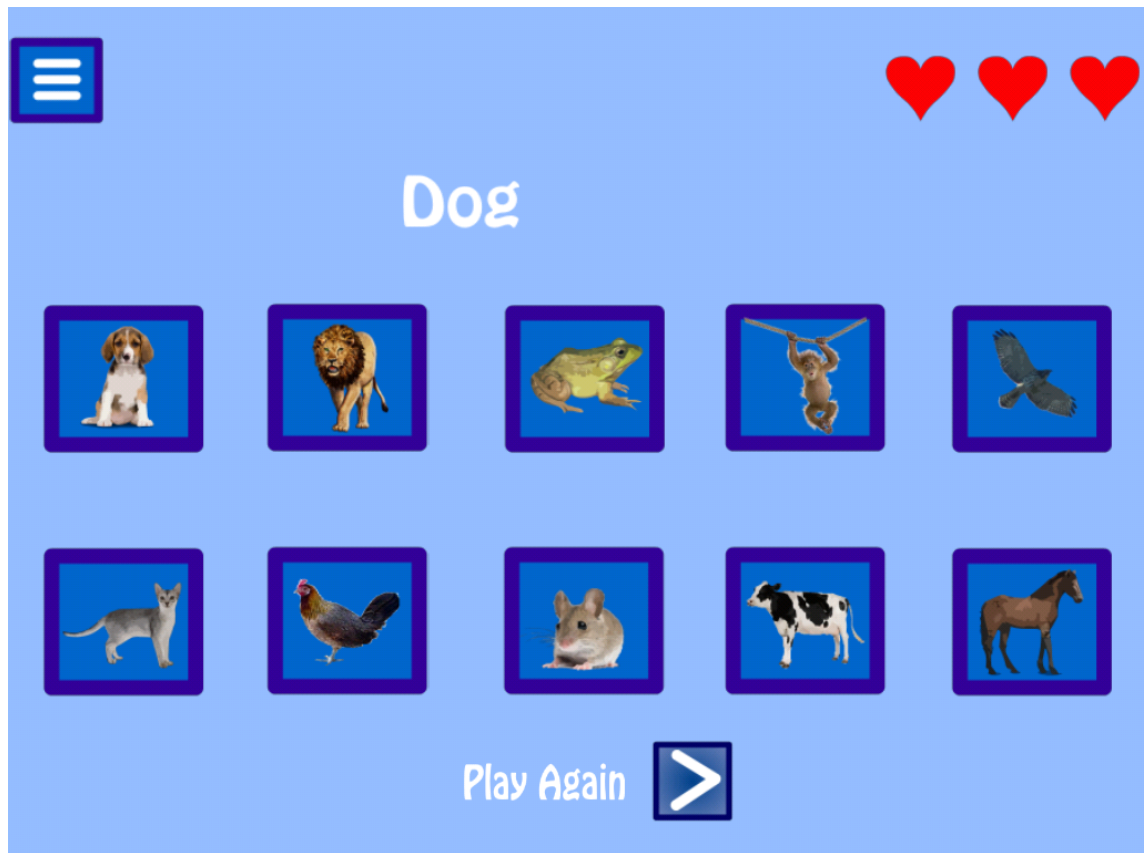

Level 2 shown in the Figure 3.4 is related to numbers again. The user is requested to catch the number of apples written in the upper-center of the screen and transmitted with audio at the same time. Apple is inserted into the basket with moving the basket right and left. After collecting the required number of apples, the new question is asked. The number of collected apples is displayed on the screen in each question. The numbers of five, ten, twenty and thirty is expected to learn by users who complete the level successfully.

Figure 3.5: The screenshot of Level 3

Level 3 shown in the Figure 3.5 is related to animals. The user is requested to select the imafe of the animal whose name is written in the upper-center of the screen and transmitted with audio at the same time. If the answer is incorrect, the one of life rights that showed with three red heart symbol in the right upper of the screen is missed and the same question is expected to answer. If the answer is correct, new question is asked. The animals' name of dog, cow, frog, horse, bird, lion, mouse, cat, chicken and monkey is expected to learn by users who complete the level successfully.

Figure 3.6: The screenshot of Level 4

Level 4 shown in the Figure 3.6 is related to fruits. The user is requested to select the imafe of the fruit whose name is written in the upper-center of the screen and transmitted with audio at the same time. If the answer is incorrect, the one of life rights that showed with three red heart symbol in the right upper of the screen is missed and the same question is expected to answer. If the answer is correct, new question is asked. The fruits' name of strawberry, apple, coconut, orange, kiwi, cherry, grapes, pears, lemon, banana is expected to learn by users who complete the level successfully.

Figure 3.7: The screenshot of Level 5

Level 5 shown in the Figure 3.7 is related to numbers and fruits. The user is requested to catch the number of fruits which is written in the upper-center of the screen and transmitted with audio at the same time. Fruit is inserted into the basket with moving the basket right and left. If the user catch the wrong fruit, the one of life rights that showed with three red heart symbol in the right upper of the screen is missed. After collecting the required number of fruits, the different number of different fruit is asked. The number of collected fruits is displayed on the screen in each question. At the end of this level, the knowledge about the numbers and the fruits learned in previous levels is expected to intensify by users who complete the level successfully.

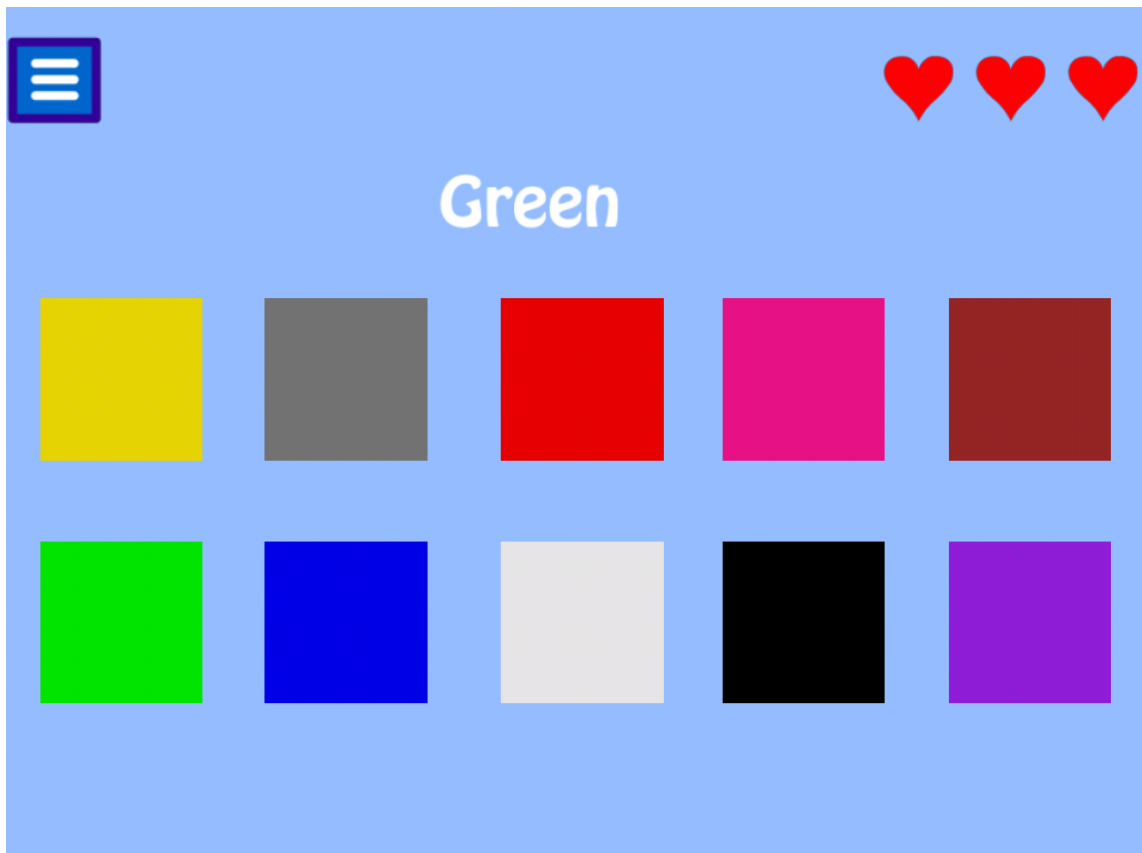**Figure 3.8: The screenshot of Level 6**

Level 6 shown in the Figure 3.8 is related to colors. The user is requested to select the imafe of the color whose name is written in the upper-center of the screen and transmitted with audio at the same time. If the answer is incorrect, the one of life rights that showed with three red heart symbol in the right upper of the screen is missed and the same question is expected to answer. If the answer is correct, new question is asked. The colors' name of yellow, gray, red, pink, brown, green, blue, white, black, purple is expected to learn by users who complete the level successfully.

Figure 3.9: The screenshot of Level 7
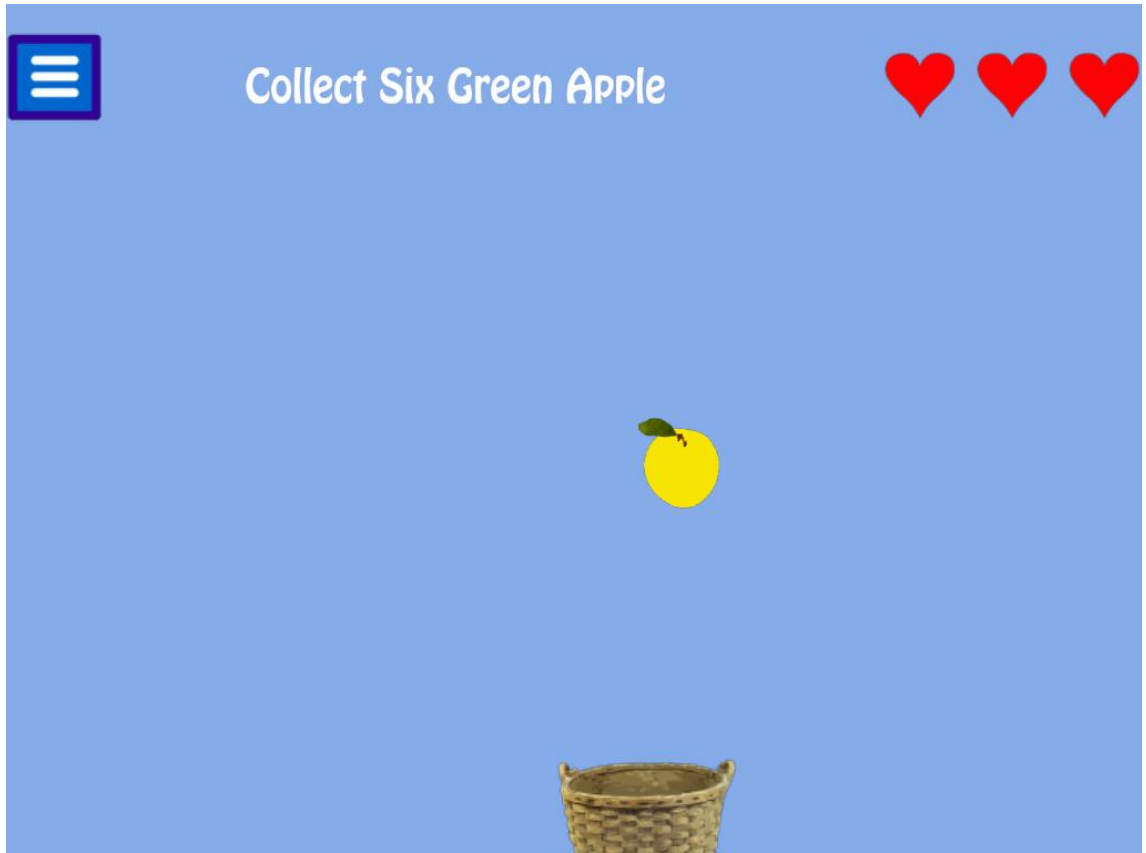
Level 7 shown in the Figure 3.9 is related to numbers and colors. The user is requested to catch the number and the color of apples which is written in the upper-center of the screen and transmitted with audio at the same time. Apple is inserted into the basket with moving the basket right and left. If the user catch the apple in wrong color, the one of life rights that showed with three red heart symbol in the right upper of the screen is missed. After collecting the required number of apples in requested color, the different number of different color of apple is asked. The number of collected apples is displayed on the screen in each question. At the end of this level, the knowledge about the numbers and the colors learned in previous levels is expected to intensify by users who complete the level successfully.

Figure 3.10: The screenshot of Level 8

Level 8 shown in the Figure 3.10 is related to seasons. The user is requested to select the sesason which is represented by the image shown in the screen. Spring is represented by flower; summer is represented by sun; fall is represented by dried leaves and winter is represented by snowflake. If the user select the wrong season, the one of life rights that showed with three red heart symbol in the right upper of the screen is missed. The asked 25 questions is expected to answered before the end of the 3 life rights. The number of correct answers is displayed on the screen. At the end of this level, the seasons of summer, fall, winter and spring is expected to learn by users who complete the level successfully.

Figure 3.11: The screenshot of Level 9
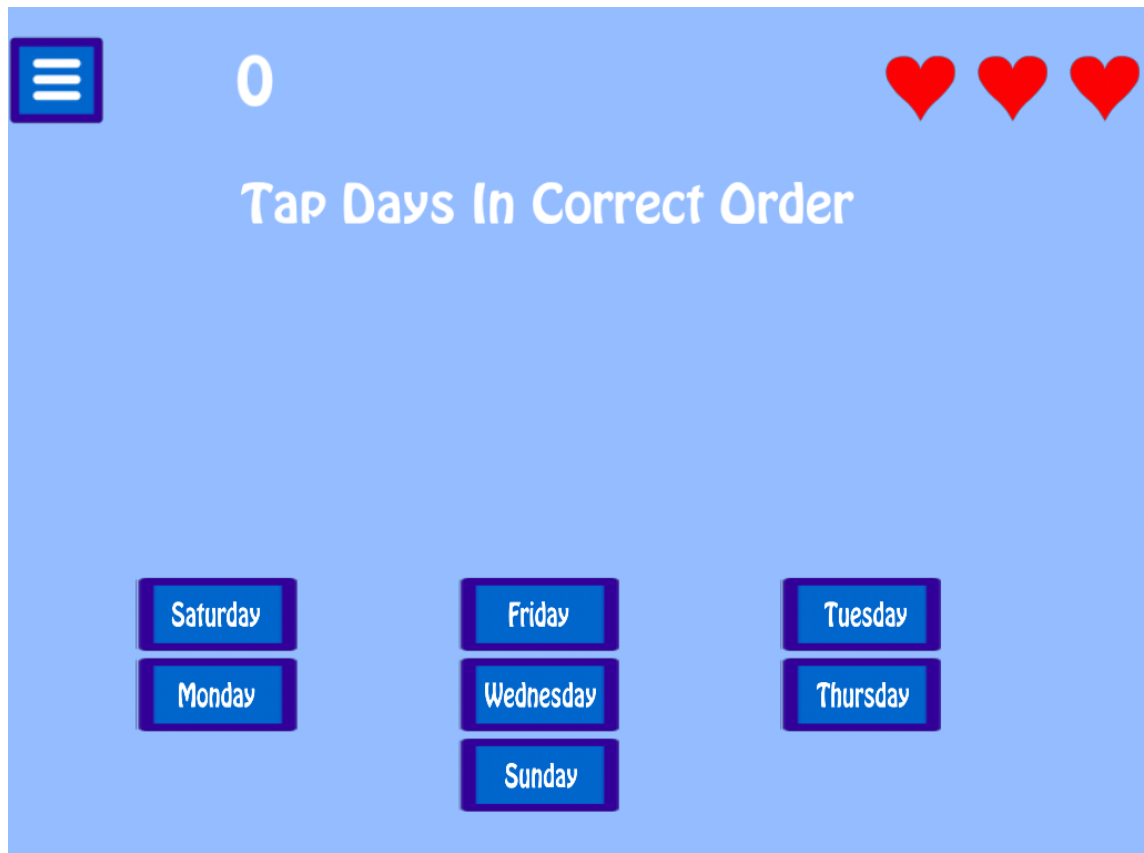
Level 9 shown in the Figure 3.11 is related to days. The user is requested to correct order the days. Meanwhile, the day is transmitted with audio. If the user select the wrong day, the one of life rights that showed with three red heart symbol in the right upper of the screen is missed. Days is expected to order before the end of the 3 life rights. At the end of this level, the days of Monday, Tuesday, Wednesday, Thursday, friday, Saturday and Sunday are expected to learn by users who complete the level successfully.

Figure 3.12: The screenshot of Level 10
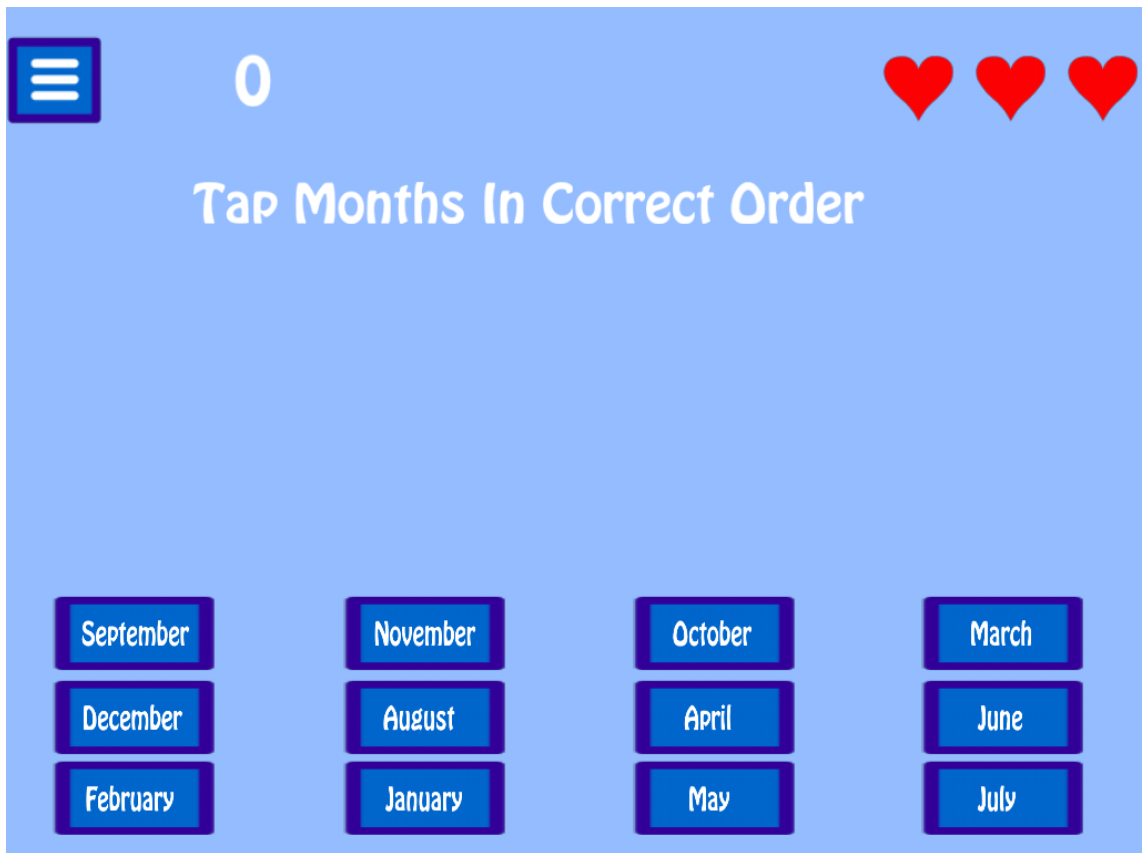
Level 10 shown in the Figure 3.12 is related to months. The user is requested to correct order the months. Meanwhile, the month is transmitted with audio. If the user select the wrong month, the one of life rights that showed with three red heart symbol in the right upper of the screen is missed. Months is expected to order before the end of the 3 life rights. At the end of this level, the months of January, February, March, April, May, June, July, August, September, October, November, December are expected to learn by users who complete the level successfully.

Figure 3.13: The screenshot of Level 11

Level 11 shown in the Figure 3.13 is a bonus level about numbers. The user is requested to catch many apples as user can. Apple is inserted into the basket with moving the basket right and left. If the user catch any the apple, the one of life rights that showed with three red heart symbol in the right upper of the screen is missed. At the end of the 3 life rights, the feedback about the number of catched apples is given to users and user can get points according to this number. At the end of this level, the numbers of catched apples is expected to intensify by users.

3.1.4 Evaluation

In this phase, information and experiences obtained from the beginning of designing the game were evaluated. Designing an educational game is more complex than designing a game because of the balance between properties of game and educational content should be provided. The characteristics of target group, selection of appropriate tools and designing attractive interface is important to not encounter with any problem at the end of designing game. Although all phases of designing game was done carefully, this is

not show that the aim of game is achieved and the game is correctly designed. The results of observation of the students who play the game; surveys, interviews and achievement tests that applied to students after the playing should be examined for real evaluation of game. The result of this study was showed the evaluation of the Diamon game at the same time.

3.2 STUDY GROUP

The study group of this research consists of 6 years old students in the 2013-2014 academic years. The 52 students selected randomly for study group from Yedicüceler Kindergarten. Students were selected without paying attention to the English level, gender or other properties. The 29 of selected students are girl and 23 of them are boy.

3.3 EXPERIMENTAL DESIGN

A single group pre-test post-test model and a motivation survey were used as research model. A test was applied to randomly selected group verbally before and after the playing game. Because of the 6 years old students cannot read and write. Experiment period was five days. At the first day of experiment, students must complete pre-test that evaluates their knowledge regarding the Diamon game vocabulary. Before students start playing the Diamon game, the information about the study was given; educational game was introduced to students during the first 20 minutes. The next step was playing the game. During the game, students were helped at the point where they don't understand how to play the game by research practitioner. Students played the game 1 hour per day in five days. Once finished the playing game period, the post-test was applied verbally again to students. By comparing the results of the post-test with the ones of the pre-test, we know whether our game-like application is effective or not for students' success. After the post-test, the motivation survey was applied to children verbally for measuring the motivational effect of the game. By analyzing the results of the motivation survey, we know whether our game-like application is motivated or not for students.

3.4 THE ENGLISH TEST

In the study, the test was prepared from subjects were expected the students to learn at the end of the game. Pre-test and post-test was prepared by the researcher and focused on the subjects of numbers, colors, fruits, animals, days, months and seasons which taught from the game and consisted of matching questions. In order to know whether the Diamon game is effective or not for students' success, the same test was applied to the students verbally before and after playing the game. The test results were evaluated over 100 points. Data were collected with the results of pre-test and post-test. The collected data were analyzed to measure effect of the game to students' success.

3.5 THE MOTIVATION SURVEY

In the study, the motivation survey was prepared based on Keller's (2010) Instructional Materials Motivational Survey (IMMS) to measure the motivational effect of the game on students. IMMS was developed according to Keller's ARCS principle was created to help the design of motivational aspects of the learning environment. The meaning of ARCS came from the four motivational factors that are attention, relevance, confidence, and satisfaction (Keller, 1987). The IMMS consisted of 36 questions with the five point Likert scale to evaluate these four factors. The IMMS should be modified when using IMMS in the research according to the needs, study group and subject of study. Also, Keller (2010) stated that the author of the instrument, the IMMS can be adapted to fit specific research needs in various situations.

Kutu and Sözbilir (2011) showed that the valid and reliable 24-item version of the IMMS was suitable for use in cultural conditions of Turkey. But, this version of survey was not appropriate level of children to understand and answer the items correctly. Some questions of the survey was modified and eliminated according to level of children. Finally, the 14 item motivation survey with the three point Likert was created and administered to children after the post-test for measuring the motivational effect of the Diamon game. The seven of this item was related to attention and relevance; and the seven of this item was related to confidence and satisfaction. For each item of the motivation survey, the response scale ranges from 1 to 3, with a 1 response signifying not true, a 2 response moderately true, a 3 response signifying very true.

3.6 ANALYSIS OF DATA

In the study, SPSS (Statistical Package of Social Sciences) program was used to analyze of obtained quantitative data of the group. The test was applied to the study groups before and after the game for analyzing. Results of pre-test and post-test were entered to SPSS. Paired sample t-test performed on the entered data to examine the significance difference between the workgroup's achievement scores of pre-test and post-test. Paired sample t-test is a method that used to compare the results of the group in two different situations. Furthermore, the motivation survey was applied to the study group after the post-test for analyzing. Results of the motivation survey were entered to SPSS. Firstly, the Cronbach Alpha values of survey and it's all subscales were measured in SPSS to determine the internal consistency coefficient of the survey. The Cronbach Alpha value is a suitable calculation method for understanding the reliability of norm referenced testing. Then, the mean of motivation survey's result was analyzed with frequency distribution for a single variable based on attention, relevance and confidence, satisfaction. The mean values were assessed according to the intervals obtaining from the width of scale between the lowest value 1 and the maximum value 3 dividing to the number of scales. The values between 1 and 1,66 is accepted "not true", the values between 1,66 and 2,33 is accepted "moderately true", The values between 2,33 to 3 is accepted "very true".

4. RESULTS

In this section, the results of the obtained data from the study were given. This research was carried out on the opinion of students' achievement levels would be increased with the use of serious games and learning English with games is motivational for students in English education. Firstly, serious English games lead to or do not lead to any change in language level of the 6-year-old students was investigated. The results of analyzed data obtained from the results of pre-tests and post-tests were shown in the following two tables.

Table 4.1: Paired samples statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PreTest	23,4615	52	12,05130	1,67121
	PostTest	46,2308	52	21,30232	2,95410

The Table 4.1 showed that the average of the pre-test results was 23,46 and the average of the post-test results was 46,23 for participated 52 students. So, the average of the post-test results was higher than the average of the pre-test results. These results indicated that students' English achievement was increased after the game. However, the Table 4.2 needs to be examined to specify whether the difference was found significantly or randomly.

Table 4.2: Paired samples test

	Paired Differences							
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1 PreTest - PostTest	-22,762	14,73773	2,04376	-26,87224	-18,66622	-11,141	51	0,000

If the value of significance in the table of paired samples test is smaller than 0.05, the difference between the average of the post-test results and the average of the post-test results will be meaningful. In this study, the result is meaningful due to the value of the significance is 0. As a result, the Diamon serious game had a positive impact on students' achievement because of there is a significant difference between students' pre-test and post-test achievement scores.

Education with serious English games had a motivational effect on the 6-year-old students was investigated. In the reliability analysis, the Cronbach Alpha value of the motivational survey was found 0,741 which fell into an acceptable value according to the guidelines on acceptable reliability levels by DeVellis (2003). Alpha reliability value is between 0.60 and 0.80 indicates that the scale is highly reliable. However, the contribution of each item to the coefficients was examined. As it can be seen in Table 4.3, removing of any item in the survey was not cause to increase reliability value.

Table 4.3 Item-total statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
AR1	33,00	10,824	,349	,727
AR2	33,06	10,801	,385	,723
AR3	33,06	10,761	,358	,726
AR4	33,12	10,849	,329	,729
AR5	32,88	11,555	,185	,742
AR6	33,46	10,998	,289	,733
AR7	33,10	9,932	,565	,700
CS1	32,98	10,411	,482	,712
CS2	33,02	10,647	,442	,717
CS3	33,37	10,550	,317	,732
CS4	33,06	10,840	,372	,724
CS5	32,96	11,449	,197	,741
CS6	32,85	10,878	,449	,718
CS7	33,10	11,187	,232	,739

The mean of items based on attention and relevance was found 2,52 response signifying very true. This result showed that the Diamon game is motivational in terms of attention and relevance. The mean of items based on confidence and satisfaction was found 2,57

response signifying very true. This result showed that the Diamon game is motivational in terms of confidence and satisfaction. Also, the Diamon game was found motivational for students with the 2,54 mean value shown in the Table 4.4.

Table 4.4 Statistics

	N		Mean of each item	Mean of group of variable	Mean of all item
	Valid	Missing			
AR1	52	0	2,62	2,52	2,54
AR2	52	0	2,56		
AR3	52	0	2,56		
AR4	52	0	2,50		
AR5	52	0	2,73		
AR6	52	0	2,15		
AR7	52	0	2,52		
CS1	52	0	2,63	2,57	
CS2	52	0	2,60		
CS3	52	0	2,25		
CS4	52	0	2,56		
CS5	52	0	2,65		
CS6	52	0	2,77		
CS7	52	0	2,52		

5. DISCUSSION

In this study, effect of the serious game on students' success and motivation in English was investigated. This study was performed with the idea that using serious games in education will have a positive impact on the learning and serious games are motivational for students. But, this research study was conducted with several limitations:

  i.   The application is limited to the 2013-2014 academic years.
  ii. Participant group is limited to 52 students at 6 years old in Yedi Cüceler Kindergarten.
  iii. Serious game is only limited to English course.
  iv. Subjects are limited to numbers, animals, fruits, colors, seasons, days and months issues.
  v.   The application period is limited to 5 days.
  vi. The measurement of students' success is limited to results of pre-tests and post-tests.

There are three important points that are new attractive learning environments, students' interests on game and teachers' positive attitudes to occur this idea of using serious games in education will have a positive impact on the learning. Prensky (2002) stated that computers, use of the internet, distance learning and computer-assisted education will not be caused a significant educational innovation in 21st century. According to Prensky, eliminating the items which makes affliction to education and making learning funny and interesting for people will revolutionize education. Students will demand similar attractive learning environments after spending a lot of time on the computer game (Prenky, 2002). Bayırtepe and Tüzün (2007) were concluded that students like game-based learning environment which provided to reduce anxiety, to help the individual learning and to support learning as a visual. According to Can (2003), teacher candidates have positive perceptions on the use of serious computer games in education. In addition, most of teacher indicated that it plans to use this kind of games their future jobs.

During this research, students had not experienced any problem about the gaming process. The reason for this, as Prensky (2001) has stated that today's students have enormous access to digital technology and display characteristics such as digital fluency and familiarity with new technologies never before imagined, they are digital natives (Prensky, 2001).

At the end of the research, a significant difference was found between the achievement scores of the study group according to test results which were applied before and after the game. The studies examined in the literature (Lim, Nonis and Hedberg, 2006; Tüzün, Yılmaz-Soylu, Karakuş, İnal and Kızılkaya, 2009; Lee, Kweon, Noh and Kim, 2011) seem to support this conclusion. In all of these researches, the one group pre-test post-test model was used and the success of the students was increased after the game.

In the researches that carried out experimental and control group, although a significant difference was not found between the achieved success in game-based learning and the achieved success in traditional learning, there was a significant difference between pre-test and post-test results when considering the experimental and control groups separately. For instance, the studies examined in the literature (Lim, Nonis and Hedberg, 2006; Bayırtepe and Tüzün, 2007; Tüzün, Yılmaz-Soylu, Karakuş, İnal and Kızılkaya, 2009; Lee, Kweon, Noh and Kim; 2011) seem to support the same conclusion with this study that serious games had a positive effect on students' achievement.

According to another result of the research, the Diamon serious game was found motivational effect on students according to results of motivation survey. The studies examined in the literature (Chen and O'Neil, 2005; O'Neil, Wainess and Baker, 2005; Virvou and Katsionis, 2008) seem to support this conclusion. All of these researches were reached the result that serious games had a positive effect on students' motivation. Also, the researches that carried out experimental and control group in the literature (Su, 2008; Liu and Chu, 2010) seem to support the same conclusion with this study that serious games was motivational for students.

When viewed in terms of motivation and achievement, serious games has been shown to be an effective method for learning with a numerous properties. Games provide problem-focused learning, learning-by-doing approach; interactive, impressive and facilitating learning environment with playful and relaxed context. Games contribute to

the development of students' practice skills and strategic decision making abilities. Game-based learning environment reduces anxiety and supports learning as visual. In the literature (Berns, Gonzalez-Pardo and Camacho, 2012; Virvou and Katsionis, 2006; Prensky, 2001; Tüzün, Yılmaz-Soylu, Karakuş, İnal and Kızılkaya, 2009), many researches supported this ideas about the games.

Although many studies showed that the game is good for learning, there are some studies showed that games was not an effective method for learning. The levels of attractiveness and confidence was found low for students after the playing game because of distraction components of games and deficiencies in computer skills (Lim, Nonis and Hedberg, 2006; Yılmaz-Soylu, Karakuş, İnal and Kızılkaya, 2009, Lee, Kweon, Noh, and Kim, 2011). Additionally, there wasn't any study about effects of English language learning with serious games for 6 years old students in Turkey. But, the negative effects that seen in the studies with different subjects and different age ranges, were not seen when using serious games for children's language learning in this study.

6. CONCLUSION AND SUGGESTION

A single group pre-test post-test model and a motivation survey were used as research model. A pre-test was applied to 52 students who were randomly selected before the playing game. Students played the game 1 hour per day in five days. Once finished the playing game period, the post-test and the motivation survey were applied to students. By comparing the results of the post-test with the ones of the pre-test, we know whether the serious game application is effective or not for students' success. Paired sample t-test performed on the obtained data to examine the significance between the workgroup's achievement scores of pre-test and post-test. The Cronbach Alpha value was used to understand the reliability of the motivation survey. The motivation survey was found reliable to measure motivation. The frequency distribution for a single variable was used for to evaluate the obtained data from the motivation survey. At the end of the research, a significant difference was found between the achievement scores of the study group according to the test results and a significant value was found according to the motivation survey.

In conclusion, the test results indicate that serious game was increased students' knowledge and had a positive impact on students' achievement. The motivation survey results indicate that serious games was motivational for students in terms of attention, relevance, confidence and satisfaction. Serious games has been shown to be an effective method for language learning when viewed in terms of motivation and achievement.

There are the following recommendations that were developed to do researches and applications according to the findings of this study:

i.   Serious games whether is more effective than traditional learning methods would be investigated by using pre-test and post-test with experimental and control group research model.

ii. The pre-test and post-test would be administered to students on computer. Thus, the game environment with same the exam environment can affect positively students' achievement.

iii. Serious games whether is more motivational than traditional learning on students would be investigated by using a survey with experimental and control group research model.

iv. The usability of serious games would be researched. It is possible to inquiry if students have any problems in getting used to the game environment or they face to any difficulty during the playing game.

v. The effect of serious games on gender could be investigated. It is possible to inquiry if the difference between the effects of serious games whether or not on boys and girls.

vi. How serious games should be designed to offer more effective learning could be investigated.

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APPENDICES

Appendix A.1: The Motivation Survey

	Very True	Moderately True	Not True
Attendence and Relevance			
AR1. I saw that there are some interesting things that caught my attention when I saw the game first time.			
AR2. I find handling the course with playing game on tablet was remarkable.			
AR3. I learned some remarkable new information in the course.			
AR4. The content, images and sounds of game helped me to give my attention to the game.			
AR5. There were stories, pictures, and examples about the subjects covered in the game.			
AR6. I did not have a problem while playing the game.			
AR7. Game arouses the desire to learn English.			
Confidence and Satisfaction			
CS1. It was easier to learn English with playing game.			
CS2. My confidence about learning the subjects has increased when progressing in game levels.			
CS3. I think I understand many of the topics covered in the game.			
CS4. I want to learn a lot more about the subject because of I enjoy playing the game.			
CS5. I learned English with the game by taking pleasure.			
CS6. I was happy to complete successfully the game.			
CS7. My confidence about learning English has increased after the game.			